Chapter 2 - Proposed Action and Alternatives

In this Chapter:

- BPA's Proposed Action
- Alternatives to the Proposed Action Including No Action
- Alternatives Considered But Eliminated from Detailed Study
- Descriptions of the Proposed Wind Projects
- Comparison of Alternatives and Summary of Impacts

This chapter describes two action alternatives and the No Action Alternative BPA is evaluating in detail in this EIS, and other alternatives considered but eliminated from detailed study. Summaries of the proposed Klondike III Wind Project and Biglow Canyon Wind Farm are also provided. The chapter concludes with comparative summaries of how each alternative addresses the purposes described in Chapter 1 of this EIS, as well as the potential environmental impacts of each alternative based on the analysis contained in Chapter 4 of this EIS.

2.1 BPA's Proposed Action

BPA's Proposed Action is to: (1) enter into interconnection agreements with PPM and PGE for their proposed wind projects; and (2) construct and operate a new ***double-circuit*** 230-kV transmission line and ancillary facilities from the proposed wind projects to BPA's John Day 500-kV Substation. These actions would allow the proposed wind projects to be interconnected with the FCRTS. The preferred route for the new BPA transmission line is the North Alternative (see Map 1). The 12-mile long line would generally extend north from PPM's Klondike Schoolhouse Substation for about 5.3 miles, and then west for the remaining 6.7 miles to the John Day Substation.

PPM's Klondike III project would be tied into the new line at Klondike Schoolhouse Substation. The Biglow Canyon Wind Farm would connect to the line at a new substation built by PGE located in between Klondike and the new John Day 230-kV Substation. The line would be constructed to carry up to 600 MW of capacity in each circuit to allow for additional capacity in the future.

To connect the new 230-kV transmission line to the FCRTS at the existing John Day 500-kV Substation, BPA would both expand the existing substation and construct a new 230-kV substation immediately adjacent to the existing substation. BPA would construct a new ***bay*** at the existing John Day 500-kV Substation and add two ***circuit breakers*** and associated disconnect ***switches***. BPA would also extend the substation's existing south fence on existing BPA property to add a ***dead end*** tower to connect to the new 230-kV substation. The expanded area would be about 0.1 acre.

The new 230-kV substation would be directly south of the existing John Day 500-kV Substation. The new substation would occupy about 5 acres, and would include a 500/230-kV ***transformer***, ring bus and other typical substation equipment. BPA would purchase 15 acres in fee for the proposed John Day 230-kV Substation.

The remainder of this section describes the proposed transmission line and ancillary facilities in more detail.

2.1.1 Proposed Double-Circuit 230-kV Transmission Line

BPA proposes to build a double-circuit 230-kV transmission line (see Map 1). Double circuit means carrying two transmission lines on one ***structure***. For this project, a 230-kV line would be on each side of either a steel tube or a ***lattice steel*** tower. The preferred route for this line is the North Alternative, which is about 12 miles long.

2.1.2 Transmission Structures

Steel tubes and lattice steel towers would be used to suspend the 230-kV transmission line in the air (see Figure 1). Steel tubes would be used for ***tangent*** and small angle structures. Steel tubes average about 125 feet tall, with the average span 900 to 1,000 feet (see Figure 1). Steel tubes are usually preferred in agricultural areas because they do not disrupt farming practices as much as other types of structures.

BPA would use lattice steel towers for the ***dead-end*** structures needed for the lines. Dead-end structures equalize tension of the ***conductors*** between two segments of transmission line where the line makes a turn. The last transmission structures on lines entering a substation are also dead-end towers. These towers are built with extra strength to reduce conductor tension on ***substation dead-ends*** and to provide added reliability to the substation.

Lattice steel towers would be used for dead-end towers because they are more cost effective than steel tubes. Lattice steel towers average about 120 feet tall, with the average span 1,000 to 1,200 feet (see Figure 1).

Transmission structures are attached to the ground with footings. Preliminary geological reports indicate that there may be basalt rock anywhere from 4 to 25 feet below ground level where new structures may be built. Three structure foundations could be used depending on the conditions at each tower site. Prior to construction, a subsurface report would be completed for each site to predict the type of footing needed.

Steel Tubes — If no rock is encountered, steel tubes would be direct embedded in the ground about 20 to 25 feet, in a hole about 5 feet in diameter. If rock is encountered, a 6-foot diameter concrete pier footing with steel reinforcement, with possible rock anchors, would be installed. The steel tube would be bolted to the top of the concrete footing.

A track-mounted drill rig would be used to drill the holes. Select material would be used for backfill around the steel tube footing.

Lattice Steel — Lattice steel towers would be attached to the ground at each of the four tower corners. Three types of footings would be used depending on the type of soil and tower type.

- ***Plate footings*** are 6 foot by 6 foot steel plates buried about 10 feet deep.
- ***Grillage footings*** are a 10 foot by 10 foot assembly of steel I-beams that are welded together and buried about 10 to 12 feet deep.
- Rock anchor footings are used when a tower is built on solid rock. Holes are drilled into the rock and steel anchors are secured within the hole with concrete. The tower footings are anchored to the rods.

A track hoe would be used to excavate an area for the footings. The excavation sidewalls would be sloped or shored to prevent collapse. All the soil and rock materials removed would be used to backfill the excavated area once the footings are installed.

Transmission structures would normally be assembled in sections at a structure site and lifted into place by a large crane (30 to 100 ton capacity). The construction of a tower and its footings could disturb an area of about an acre (200 feet by 200 feet) using plate and grillage footings.

2.1.3 Conductors and Insulators

The wires that carry electrical ***current*** in a transmission line are called ***conductors***. The conductor proposed for this project would be about 1.3 to 1.6 inches in diameter. Conductors are suspended from tubes and towers with ***insulators***. Insulators are made of nonconductive materials (rubber, porcelain or fiberglass) that prevent electric current from passing through the towers to the ground. Insulator strings of non-reflective material for BPA's line would be 10 inches in diameter and 7 feet long.

Conductors and insulators would be installed after the tubes and towers have been built. A pulling cable called a "sock line" would be placed in pulleys or travelers that are attached to the insulators on the structures. The sock line would be pulled through the pulleys, usually by helicopter. The end of the sock line would be attached to a conductor on large reels mounted on trucks equipped with a brake system that allows the conductor to be unwound under tension. The sock line would be used to pull the conductors through the series of pulleys mounted on the structures. Conductor tensioning sites would typically be located every 2 to 3 miles.

About 10 tensioning sites would be required for this project. Conductor tensioning sites would typically disturb an area of about 1 acre. Disturbance would be temporary. Any disturbed area would be restored to pre-construction conditions.

At the dead-end structures, there are two primary methods available to BPA to attach the conductor to the structure. The first method, hydraulic compression fittings, uses a large press and pump that closes a metal clamp or sleeve onto the conductor. This method requires heavy equipment and is time consuming. The second method, implosive fittings, uses explosives to compress the metal together. The implosive fittings do a better job of compressing the sleeve onto the conductor and actually weld the

metals together. Implosive fittings do not require heavy equipment, but do create noise similar to a loud explosion when the primer is struck. BPA would use implosive fittings on this project.

A smaller wire, called an optical ***ground wire***, would also be attached to the top of the transmission structures. Ground wires are used for lightning protection. There would also be a series of wires and/or grounding rods (called ***counterpoise***) buried in the ground at each structure. These wires are used to establish a low resistance path to earth, usually for lightning protection.

This optical ground wire would also be used for communications as part of the power system. The ground wire uses ***fiber optic*** technology, which uses light pulses instead of radio or electrical signals to transmit messages. This communication system can gather information about the system (such as the transmission lines in service and the amount of power being carried, meter readings at interchange points, and status of equipment and alarms).

2.1.4 Right-of-Way

BPA would acquire ***easements*** to build, operate and maintain the transmission line across private properties. In general, the ***voltage*** of a transmission line is the primary factor in determining the necessary width of the ***right-of-way*** (ROW) required for the line for safety and other reasons. Because of the voltage of the proposed transmission line, a new 125-feet wide ROW would be required for the full 12-mile length of the line.

2.1.5 Right-of-Way Clearing

Most of the land along the ROW is in wheat production or has other low-growing vegetation compatible with transmission lines. Tall trees cannot be allowed to grow into or near the lines because electricity can arc, which can start a fire or injure or kill someone nearby. There are few tall trees along the proposed route and no trees would likely be removed.

2.1.6 Access Roads

BPA would use the existing road system as much as possible for construction. The proposed line currently parallels existing roads in the area, such as North Klondike Road and Herrin Road, for much of its length. However, some portions of the proposed line do not currently have road access, and access would be necessary for construction to each transmission structure site. BPA would purchase easements for ***access roads***. Any roads needed in farmed fields would be about 14 feet wide, would be designed to be temporary and would be removed after construction, unless requested to be left in place by the landowner. If construction were scheduled during the dry season, little or no rock is anticipated to be necessary on the roads. Access roads would be used by cranes, excavators, supply trucks, boom trucks, and line trucks for construction of the transmission line.

Ground disturbed for temporary roads would be restored to its pre-construction condition after the transmission lines would be built. If crop damage were to occur during construction or maintenance, landowners would be compensated. The location of temporary roads would generally fall within the transmission line ROW. BPA would purchase the rights to a permanent access road system. Access road locations would be coordinated with landowners, to the extent practical, to minimize impacts on property.

2.1.7 Gates

Some landowners/land managers have policies regarding public access to their properties. Locked gates are commonly used to restrict public access. BPA cooperates with landowners on a case-by-case basis on permanent access, gates and locks. At this time, the exact location of any locked gates that could be required is unknown.

2.1.8 Staging Areas

During transmission line construction, steel, electrical conductors, insulators and hardware are often stockpiled at a site called a staging area or material yard that is near the proposed line. BPA would secure temporary rights to establish a material storage yard and contractor staging area. BPA's storage yard/staging area would be about 5 to 10 acres. The location of this staging area would depend on the needs of the project and would be determined prior to construction. To facilitate construction efficiency, staging areas tend to be located next to highways and main roads. Staging areas are only used prior to and during construction. After construction, the staging areas would be removed, and the disturbed areas would be restored to their pre-construction conditions.

2.1.9 Substation Facilities

Substations contain electrical equipment that enables BPA to interconnect several different transmission lines, disconnect lines for maintenance or outage conditions, and regulate voltage. BPA proposes to expand its existing John Day 500-kV Substation, and to build a new John Day 230-kV Substation. The existing 500-KV substation would be expanded by about 0.1 acre on existing BPA property. The new 230-kV substation would occupy about 5 acres. The principal equipment that would be installed at these substations under the Proposed Action is described below.

Transformer — A transformer is a device for transferring electrical energy from one circuit to another by magnetic induction, usually between circuits of different voltages. BPA would install a new 500/230-kV transformer at the new 230-kV substation.

Power circuit breakers — A breaker is a switching device that can automatically interrupt power flow on a transmission line at the time of a fault, such as a lightning strike, trees or tree limbs falling on a line or other unusual event. New breakers would be installed at both the existing 500-kV substation and new 230-kV substation to redirect power as desired.

Switches — These devices are used to mechanically or electrically disconnect or isolate equipment. Switches are normally located on both sides of circuit breakers. Switches are planned on each side of the proposed dead-end tower at the 500-kV substation and 230-kV substation.

Bus tubing, bus pedestals — Power moves within the substation and between breakers and other equipment on rigid aluminum pipes called bus tubing. This tubing is supported and vertically elevated by pedestals called "bus pedestals."

Substation dead-end towers — These are the towers within the confines of the substation where incoming and outgoing transmission lines end. Dead-ends are typically the tallest structures in a substation. A substation dead-end structure would be installed inside both substations. The 230-kV lines would terminate on these towers.

Substation fence — A chain-link fence with barbed wire on top typically is placed around all BPA substations to provide security. The fence is placed to allow adequate spacing between the fence and substation electrical equipment to maneuver construction and maintenance vehicles. The existing fence at John Day 500-kV Substation would be extended to include the new equipment. The new 230-kV substation would also be fenced.

Substation rock surfacing — A 3-inch layer of rock selected for its insulating properties would be placed on the ground within the new 230-kV substation to protect operation and maintenance personnel from electrical danger during substation electrical failures. The expanded area of John Day 500-kV Substation would also be rocked.

2.1.10 Communication Facilities

Microwave communication sites and fiber-optic communication lines connect BPA's high-voltage substations to system control centers located in Vancouver and Spokane, Washington. Dispatchers within the control centers remotely monitor meters and gauges on electric power equipment within each substation and receive alarm signals if an emergency were to occur. Dispatchers have the ability to disconnect lines and electrical equipment when transmission failures do occur through breakers and switches remotely.

Communications between the wind farm collector facilities and the proposed new 230-kV substation would be accomplished with fiber optic cables. Redundant fiber optic cables with alternate routes would be installed between the new substation and the existing 500-kV substation to ensure that no single failure would disable communications. The circuits would be connected to the existing BPA communication system.

2.1.11 Cost Estimate

The estimated construction cost for the transmission line, the new 230-kV substation and the expansion at the existing John Day 500-kV Substation is about $40-45 million.

2.1.12 Maintenance

During the life of the project, BPA would perform routine, periodic maintenance and emergency repairs to the transmission line. Maintenance usually involves replacing insulators on an as-needed basis. Twice a year, a helicopter would fly over the line to look for hot spots (areas where electricity may not be flowing correctly) or other problems indicating that a repair may be needed.

Vegetation is also maintained along the line for safe operation and to allow access to the line. The area would need little vegetation maintenance because it is mostly farmed.

If vegetation maintenance is needed, BPA's vegetation management would be guided by its Transmission System Vegetation Management Program EIS (see Section 3.11.4 for more information). BPA uses an integrated vegetation management strategy for controlling vegetation along its transmission line rights-of-way. This strategy involves choosing the appropriate method for controlling the vegetation based on the type of vegetation and its density, the natural resources present at a particular site, landowner requests, regulations, and costs. BPA may use a number of different methods: manual (hand-pulling, chainsaws), mechanical (roller-choppers, brush-hogs), biological (insects or fungus for attacking noxious weeds), and herbicides.

Prior to controlling vegetation, BPA sends notices to landowners and requests information that might help in determining appropriate methods and ***mitigation*** measures (such as herbicide-free buffer zones around springs or wells). Noxious weed control is also part of BPA's vegetation maintenance program and BPA works with the county weed boards and landowners on area-wide plans for noxious weed control.

2.2 Middle Alternative

With the Middle Alternative, BPA would also: (1) enter into interconnection agreements with PPM and PGE for their proposed wind projects; and (2) construct and operate a new double-circuit 230-kV transmission line and ancillary facilities from the proposed wind projects to BPA's John Day 500-kV Substation. The transmission line for the Middle Alternative would originate from the same location as the Proposed Action, but would follow a different route to the new substation (see Map 1). This transmission line route would be about 12.5 miles long.

The Middle Alternative has all the components of the Proposed Action.

The estimated cost for the Middle Alternative is about $40-45 million, about the same as the Proposed Action.

2.3 No Action Alternative

The No Action Alternative is often called the no-build alternative. Under this alternative, BPA would not sign interconnection agreements with PPM and PGE, and would not construct a new BPA substation, expand the existing John Day 500-kV

Substation, or construct a transmission line. The environmental impacts described for each of the BPA action alternatives would not occur. In addition, it is likely that both PPM's and PGE's proposed wind projects would not be built since there appears to be no feasible interconnection option for these projects other than the FCRTS.

2.4 Alternatives Considered but Eliminated from Detailed Study

In developing this EIS, BPA considered a wide range of potential alternatives. This range included alternatives developed by BPA based on its knowledge of transmission line design and possible environmental issues, as well as alternatives that either were suggested or responded to concerns raised during the scoping process for this EIS. For each potential alternative, BPA assessed whether the alternative was reasonable under NEPA and merited detailed evaluation in this EIS, or was not reasonable and could be eliminated from detailed study.

BPA considered several factors in making this assessment of potential alternatives. BPA considered whether the potential alternative would meet the identified purposes and need for the proposed action (see Chapter 1). In addition, BPA considered whether the alternative would be practical and feasible from a technical and economic standpoint and using common sense, consistent with the Council of Environmental Quality Guidance on assessing the reasonableness of alternatives. Finally, BPA considered whether the alternative would have greater adverse environmental effects than the proposed action.

Alternatives deemed not to merit detailed evaluation in this EIS were those that did not meet the stated purpose and need for the proposed action, that were not practical or feasible, or that would have greater adverse environmental effects than the proposed action. This section summarizes the alternatives that were considered but have been eliminated from detailed study in this EIS.

2.4.1 Alternative Transmission Line Voltages

BPA considered other line voltages for a transmission line. A 115-kV line, (even if double-circuit), would not have the capacity for the amount of energy produced from the wind projects.

A 500-kV line would have more than enough capacity, but the cost would be prohibitive. A 500-kV line would also require larger towers and more ROW (150 feet) and would increase the impacts to visual resources and farming practices.

2.4.2 Underground Transmission Line Alternative

Underground transmission lines (cables), are highly complex in comparison to overhead lines. For 230-kV lines, underground cable may be about 10 times as costly as overhead designs. Because of the cost, BPA uses underground cable in limited, special

reliability, or routing situations, such as near nuclear power stations, at locations where high capacity lines must cross long bays, or in urban areas.

2.4.3 Alternative Transmission Line Routes

BPA considered several possible alternate routes for BPA's transmission line (see Map 2). The following were eliminated based on comments received at the March 1, and April 27, 2005 public meetings and during the scoping period, or because they could create greater impacts than other alternatives.

2.4.3.1 Alternative A

In this alternative, the transmission line would go northwest from the Klondike Schoolhouse Substation; across a field to Klondike Road; north along Klondike Road; west along Medler Road; then northwest to the new 230-kV substation. This alternative was modified to place transmission lines on edges of fields, not across fields, per landowner comments. Landowners preferred that structures be placed on field edges. Parts of this alternative are now included in the Middle Alternative and this alternative was eliminated from further consideration.

2.4.3.2 Alternative B

In this alternative, the transmission line would run northwest from the Klondike Schoolhouse Substation; across a field to Klondike Road; north along Klondike Road, west along Medler Road; due west across China Hollow to the existing BPA ROW; then north, adjacent to the existing ROW to the new 230-kV substation. This alternative was eliminated from consideration because there is a quarry where blasting occurs along the route. Also, China Hollow has one of the better riparian areas in the area and so this alternative was eliminated to avoid disturbing it.

2.4.3.3 Alternative C

This alternative ran northwest from the Klondike Schoolhouse Substation to the west end of Medler Road, then northwest to John Day Substation. This alternative was eliminated from consideration in response to landowners' concerns about disrupting farming practices. Landowners preferred to have structures on the edge of fields instead of in the middle of fields.

2.4.3.4 Alternative D

In this alternative the transmission line ran northwest from the Klondike Schoolhouse Substation to the west end of Medler Road; due west across China Hollow to the existing BPA ROW; then north, adjacent to the existing ROW to the new 230-kV substation. This alternative was eliminated from consideration for the same reasons as

Alternative B, because of the existing quarry and China Hollow. In addition, there were concerns about conflicting with farming practices.

2.4.3.5 Alternative E

In this alternative the transmission line ran west along Klondike Road from Klondike Schoolhouse Substation passing south of the city of Wasco to the existing BPA ROW; then north, adjacent to the existing ROW to the new 230-kV substation. This alternative was eliminated from consideration in response to comments. This route would come close to a new home and is also close to the town of Wasco. It also would create impacts to farming operations. Parts of this alternative became the South Alternative.

2.4.3.6 South Alternative

The original South Alternative was modified during the scoping period by moving the east to west portion of the route approximately one-half mile farther south to run along existing property lines and minimize farmland and residential impacts. This route ran due south from the Klondike Schoolhouse Substation; then due west and parallel to Klondike Road, intersecting with an existing BPA ROW; then north, adjacent to the existing ROW to the new 230-kV substation. This alternative was eliminated from further consideration because transmission structures would interfere with farming practices though the structures would be on section lines. It was also the longest alternative, which increases costs.

Originally, a new substation site along the South Alternative also was proposed during scoping. It was eliminated from consideration because it was associated with the South Alternative that has been eliminated from detailed study in this EIS.

2.5 Proposed Wind Projects

A reasonably foreseeable consequence of implementing either of BPA's action alternatives is the construction and operation of the wind projects respectively proposed by PPM and PGE. This section describes these two projects.

2.5.1 Klondike Wind Project

The Klondike III Wind Project, which would be built by Klondike Wind Power III LLC (KWP), a wholly-owned subsidiary of PPM Energy, Inc., would consist of a wind generation project in northern Sherman County, Oregon that would produce about 289 MW. The proposed project is adjacent to PPM Energy's Klondike I (24 MW) and Klondike II (75 MW) wind projects. It would be connected to the proposed BPA 230-kV transmission line (see Map 1).

All Klondike III facilities would be on private agricultural land. PPM has negotiated long-term wind energy leases with the landowners. The wind energy leases allow PPM to permit, construct, and operate wind energy facilities for a defined period. In exchange,

the landowners receive compensation. The terms of the wind energy leases allow landowners to continue their farming operations in and around the wind turbine generators and other facilities where the farming activities would not impact operation and maintenance of the wind generation equipment.

Klondike III facilities would consist of up to 165 wind turbines and towers, about 19 miles of new roads, up to 2 operations and maintenance (O&M) facilities, and one substation. Wind turbines and roads would be built within corridors approved by the Oregon Department of Energy. Turbine towers would be 263 feet tall (hub height) and range from 388 feet to 414 feet high, including blades. Project facilities would occupy about 74 acres of land. Construction would temporarily disturb about 295 acres.

2.5.1.1 Turbines and Towers

Wind turbines consist of two primary components: a tubular tower, and the nacelle, which rests on the tower. The nacelle houses equipment such as the gearbox and supports the turbine blades and hub. The turbines are interconnected with an underground power collection system and linked to the project substation.

The wind turbines would be grouped in linear strings; some would include aviation warning lights required by the Federal Aviation Administration (FAA). The number of turbines with lights and the lighting pattern of the turbines would be determined in consultation with the FAA.

Up to three turbine types may be used for the project; the largest turbine type would produce up to 2.4 MW (see Figure 2). The analysis in this FEIS is based on a "worst-case" situation, e.g., for the visual assessment, the tallest of the turbines was analyzed, and for the noise evaluation, the loudest was analyzed.

The blade diameter of the turbines would range from 253 to 305 feet. The height at the hub would be up to 263 feet. The swept area of the rotor would be from 50,138 to 73,195 square feet, and the rotor speed would be between 6 and 18 revolutions per minute (rpm).

The tower supporting each wind turbine would be a tapered monopole, roughly 263 feet tall. It would be supported by a spread footing concrete foundation. The underground footprint of each foundation would be about 2,000 square feet. The actual foundation design would be determined based on site-specific geotechnical information and structural loading requirements of the selected turbine model. The towers would be uniformly painted a neutral gray or white color. Each tower would have a locked entry door at ground level and an internal access ladder with safety platforms for access to the nacelle. A controller cabinet would be inside each tower at its base. Towers are typically fabricated in three sections that are assembled on-site, and they are designed to withstand the maximum wind speeds expected at the project – typically 134 miles per hour (mph) at hub height.

A generator step-up (GSU) transformer would be installed at the base of each wind turbine to increase the output voltage of the wind turbine to the voltage of the power

collection system (typically 34.5-kV). Small concrete slab foundations would support the GSU transformers.

2.5.1.2 Power Collection System

A network of underground power lines would primarily be installed within the prism of new and existing roads at the project to collect power generated by the individual wind turbines and route the power to a switchyard for delivery into the utility grid. The power collection system would operate at 34.5-kV. Where geotechnical conditions or other engineering considerations require, the collector system may be aboveground.

Power from the eastern section of the project would be routed to a switchyard near Webfoot (see Map 1). From that switchyard, an aboveground double-circuit 34.5 kV collector line would carry the power about 3.5 miles to the new substation adjacent to the Klondike Schoolhouse Substation. The poles would be about 110 feet tall, and sunk 30 feet deep. They would be spaced about 500 to 700 feet apart. The 34.5-kV collector line would be on single-shaft wood poles, or wood-equivalent tubular steel poles spaced 200-300 feet apart. Depending on terrain and ground clearance, single-circuit poles would be 40-55 feet above grade and double-circuit poles will be 50-65 feet above grade. Pole strength and pole embedment depth would be designed according to wind loading and the strength of soils. Embedment depth for this area is expected to be 8-12 feet. Guys and anchors would support the poles at line angles and dead ends. All poles would conform to raptor protection guidelines of the Avian Powerline Interaction Committee (1996).

2.5.1.3 Interconnection/Substations

A new substation would be constructed on about 5 acres adjacent to the existing Klondike Schoolhouse Substation to accommodate and step up the additional power entering the grid. The additional substation would include foundations, circuit breakers, power transformer(s), bus and insulators, disconnect switches, relaying, battery and charger, surge arrestors, control house, metering equipment, supervisory, control and data acquisition (SCADA) provision, grounding, fence, and associated control wiring. The substation facilities would conform to all applicable Oregon and BPA regulations and standards.

2.5.1.4 Operations and Maintenance Facility

An O&M building about 5,000 square feet would be built on the Klondike III site, on a 5-acre parcel near Webfoot. A water supply (on-site well of less than 5,000 gallons per day) and sanitary facilities would be constructed at the new O&M site to serve Klondike III. Power to the new O&M building would be supplied by Wasco Electric Cooperative and would be carried from the existing O&M building, about 2 miles east. A second O&M building may be built on a 5-acre parcel east of this site.

2.5.1.5 SCADA System

A SCADA system to be installed at the project would collect operating and performance data from each wind turbine and the project as a whole, and provide remote operation of the wind turbines. The wind turbines would be linked to a central computer via a fiber optic network. The host computer is expected to be located in the O&M facility at the project site.

2.5.1.6 Meteorological Towers

Three permanent, un-guyed, meteorological towers to collect wind resource data would also be part of the facility.

2.5.1.7 Roads

About 19 miles of new roads would be constructed to access turbines. The roads would be 20 feet wide and constructed with crushed gravel. Existing roads near the project would be upgraded and widened, where necessary, to accommodate construction and O&M equipment. Temporary access roads may also be built during construction. They would be removed after construction.

2.5.1.8 Construction Laydown Areas

About 55 acres of temporary disturbance would occur in 19 laydown areas that would be used to stage construction and store supplies and equipment during construction. A 2-acre laydown area would be next to each proposed turbine string, and four 4-acre laydown areas would be located throughout the project site. The laydown areas would have a crushed gravel surface. After construction, the laydown areas would be removed, and the disturbed areas would be restored to their pre-construction conditions.

2.5.2 Biglow Canyon Wind Farm

The Biglow Canyon Wind Farm, proposed by PGE, would produce up to 400 MW in northern Sherman County. It would be connected to BPA's transmission system at one of two alternative substations on the Biglow Canyon Wind Farm site. PGE is responsible for selecting its substation alternative.

The project would be built on private land. PGE has negotiated long-term wind energy leases with the landowners in which the energy facilities would be constructed and operated in exchange for compensation.

The Biglow Canyon Wind Farm would consist of up to 225 wind turbines and towers, about 40.5 miles of new roads, an O&M facility, and a substation. Wind turbines and roads would be built within 500-foot wide corridors. Project facilities would occupy up to about 177 acres of land.

2.5.2.1 Turbines and Towers

Generally, the turbines and towers for the Biglow Canyon Wind Farm would be similar to those described for Klondike III. As with Klondike III, the specific turbine type has not yet been selected. The largest turbine type proposed for Biglow Canyon would produce up to 3 MW (see Figure 2). The blade diameter of the turbines would likely be up to 328 feet, and the tower height would be up to 279 feet. Overall height of the wind turbines would be up to 443 feet. The analysis in this FEIS is based on a "worst-case" scenario, as described for Klondike III.

2.5.2.2 Power Collection System

A transformer would be placed next to each turbine tower to increase the output voltage to 34.5-kV. Each transformer would be placed on a concrete slab. From the transformer, power would be transmitted via electric cables, some of which would be buried. In areas where collector cables from several turbine strings follow the same alignment (e.g., near the facility substation), multiple sets of cables could be installed within a single trench. There would be about 89 miles of underground electric cables.

In some areas, collector lines may be installed aboveground on poles or towers. Aboveground lines would allow the collector lines to span terrain such as canyons, native grasslands, ***wetlands***, and ***intermittent*** streams, thereby reducing environmental impacts, or to span cultivated areas and reduce impacts to farming. Overhead structures would generally be between 37 and 60 feet tall.

2.5.2.3 Substation and Interconnection to BPA

The Biglow Canyon Wind Farm would be connected to BPA's transmission system at one of two alternative substations on the Biglow Canyon Wind Farm site. PGE is responsible for selecting its substation alternative (see Map 1). With either alternative, the proposed substation site would be a graveled, fenced area of up to 6 acres, with transformer and switching equipment and a parking area. Transformers would be non-PCB (polychlorinated biphenyl), oil-filled types.

2.5.2.4 Operations and Maintenance Facility

A permanent O&M facility would include about 5,000 square feet of enclosed space, including office and workshop areas, control room, kitchen, bathroom, shower, utility sink, and other facilities. Water would come from a well that would be constructed on the site. Water use is not expected to exceed 1,000 gallons per day. Domestic wastewater would drain to an on-site septic system. A graveled parking area for employees, visitors, and equipment would be built in the vicinity of the building. The O&M facility may be built next to the proposed substation.

2.5.3.5 SCADA System

A SCADA system, similar to that described for Klondike III, would be installed and linked to a central computer in the O&M building.

2.5.3.6 Meteorological Towers

Up to 10 meteorological towers would be placed throughout the Biglow Canyon project. The towers, which would be up to 279 feet tall, would collect wind resource data.

2.5.3.7 Roads

Existing roads in the analysis area are typically 16 to 20 feet wide. Some existing roads would be widened — up to 35 feet for construction, and up to 16 or 18 feet wide for operation, including an additional 5 to 6 feet of shoulders. Roads would be improved, where necessary, by adding an all-weather surface.

New access roads would be constructed where there are no roads near proposed turbine strings. About 40.5 miles of new access roads would be built. They would be about 28 feet wide for operation.

Temporary access roads may also be built during construction. They would be removed after construction.

2.5.2.8 Construction Laydown Areas

Up to six principal, temporary laydown areas for construction staging would be located on site. Each laydown area would be up to 5 acres and would be covered with gravel. After construction, the gravel would be removed and the area restored.

In addition to the principal laydown areas, temporary laydown areas would be located at each turbine location and at each turbine string. Each turbine laydown area would temporarily disturb about 18,500 square feet. Placement of blades in the laydown areas is expected to result in little or no soil disturbance.

In total, construction activities (e.g., laydown areas and collector system trenches) would disturb up to 388 acres.

2.6 Comparison of Alternatives and Summary of Impacts

Table 2-1 provides a comparison of the two action alternatives and the No Action Alternative to the purposes identified in Chapter 1 of this EIS. Table 2-2 provides a summary of the potential environmental impacts and mitigation for each alternative. Detailed analysis of potential impacts is contained in Chapter 4, **Environmental Consequences** and appendices.

Table 2-1 Comparison of Alternatives to Project Purposes

Purposes	BPA Proposed Action	BPA Middle Alternative	No Action Alternative
Maintain transmission system reliability to industry standards	Best achieves this purpose due to shorter line and resulting lower energy losses than the Middle Alternative.	Achieves this purpose, but slightly less well as the Proposed Action due to its longer length and resulting higher energy losses.	Transmission system would remain at the existing levels of reliability.
Act consistently with BPA's statutory obligations	Meets this purpose.	Meets this purpose.	Meets this purpose, but not as well as either of the two action alternatives.
Continue to meet BPA's contractual obligations	Meets this purpose.	Meets this purpose.	May not meet this purpose.
Minimize environmental impacts	Creates slightly fewer environmental impacts than Middle Alternative due to shorter distance and fewer temporary and permanent impacts from road construction, tower placement, etc. Route avoids disrupting farming operations and visual impacts as much as possible. Most impacts would be temporary and located in heavily disturbed agricultural fields. BMPs and site restoration of temporary impacts would be used to minimize environmental impacts.	Creates slightly more environmental impacts than the Proposed Action due to longer distance and slightly more temporary and permanent impacts from road construction, tower placement, etc. Route creates more impacts to farming operations. Most impacts would be temporary and located in heavily disturbed agricultural fields. BMPs and site restoration of temporary impacts would be used to minimize environmental impacts.	Creates no new environmental impacts.
Minimize costs	The Proposed Action is slightly shorter than the Middle Alternative, would cost slightly less, and would best meet this purpose of the two action alternatives. Costs have been minimized by selecting the shortest alignment given site constraints, and minimizing angle structures as much as possible.	The Middle Alternative is slightly longer than Proposed Action and would cost slightly more. Costs have been minimized by selecting the shortest alignment given site constraints, and minimizing angle structures as much as possible.	No costs are associated with this alternative.
Encourage development of renewable energy resources	The Proposed Action would meet this purpose by interconnecting the two wind projects.	The Middle Alternative meets this purpose by interconnecting the two wind projects.	The No Action Alternative would not meet this purpose.

Table 2-2 Summary of Impacts from Alternatives

Resource	Existing Conditions	BPA Proposed Action	BPA Middle Alternative	Klondike III Wind Farm	Biglow Canyon Wind Project	No Action Alternative
Land Use (See Sections 3.1, Land Use and 4.1, Land Use)	All land crossed by the alternatives and the wind projects are privately owned. Almost all of the land is in agricultural production, with several small areas of CRP land. Land is zoned F-1 Exclusive Farm Use.	Low impacts. Permanent removal of about 17 acres of farmland. Impacts to farming would be minimized by using steel pole towers. Landowners would be compensated for temporary crop damage.	Low impacts. Permanent removal of about 17 acres of farmland. Impacts to farming would be minimized by using steel pole towers. Landowners would be compensated for temporary crop damage.	Low impacts. Permanent removal of about 62 acres of farmland. Impacts to farming would be minimized by using steel pole towers. Landowners would be compensated for temporary crop damage.	Low impacts. Permanent removal of about 173 acres of farmland. Impacts to farming would be minimized by using steel pole towers. Landowners would be compensated for temporary crop damage.	No new impacts are expected.
Transportation (See Sections 3.2, Transportation, and 4.2, Transportation Facilities)	Project is served by Interstate 84, Highway 97, Highway 206, local collector roads and private roads. Roads currently function at high levels of service. Bridges on potential haul routes are structurally sound (although some are functionally obsolete)	Low impacts. Temporary delays on some local collectors during construction. Some local collectors improved to allow construction traffic. No long-term level of service reduction or degradation of road surfaces. Temporary roads constructed in agricultural lands to access tower sites will be removed following construction.	Low impacts. Temporary delays on some local collectors during construction. Some local collectors improved to allow construction traffic. No long-term level of service reduction or degradation of road surfaces. Temporary roads constructed in agricultural lands to access tower sites will be removed following construction.	Low impacts. Temporary delays on some local collectors during construction. Some local collectors improved to allow construction traffic. No long-term level of service reduction or degradation of road surfaces. Some new permanent roads will be constructed in agricultural land to serve tower sites.	Low impacts. Temporary delays on some local collectors during construction. Some local collectors improved to allow construction traffic. No long-term level of service reduction or degradation of road surfaces. Some new permanent roads will be constructed in agricultural land to serve tower sites.	No new impacts are expected.
Recreation (See Sections 3.3, Recreation, and 4.3, Recreation)	Recreation is limited to upland game hunting and sightseeing of historic trails. The John Day River Corridor, Journey Through Time Scenic Byway, and Barlow Road Cutoff Trail are important recreation facilities outside the project area.	No impacts. No impact to recreational opportunities. Some visual impacts may occur (see Visual Resources Section).	No impacts. No impact to recreational opportunities. Some visual impacts may occur (see Visual Resources Section).	No impacts. No impact to recreational opportunities. Some visual impacts may occur (see Visual Resources Section).	No impacts. No impact to recreational opportunities. Some visual impacts may occur (see Visual Resources Section).	No new impacts are expected.

Resource	Existing Conditions	BPA Proposed Action	BPA Middle Alternative	Klondike III Wind Farm	Biglow Canyon Wind Project	No Action Alternative
Geology and Soils (See Sections 3.4, Geology and Soils, and 4.4, Geology and Soils)	Terrain is gently rolling with several small canyon crossings. Slopes are stable. Surface soils are Walla Walla silt loam, which is mostly being intensively farmed for dryland wheat.	Low impacts. Temporary road construction and disturbance to soils. No increase in long-term erosion potential. Permanent impacts (low impact) to about 17 acres of Type II soils.	Low impacts. Temporary road construction and disturbance to soils. No increase in long-term erosion potential. Permanent impacts (low impact) to about 17 acres of Type II soils.	Low impacts. Temporary road construction and disturbance to soils. No increase in long-term erosion potential. Permanent impacts (low impact) to about 62 acres of Type II soils.	Low impacts Temporary road construction and disturbance to soils. No increase in long-term erosion potential. Permanent impacts (low impact) to about 173 acres of Type II soils.	No new impacts are expected.
Water Resources (See Section 3.5, Water Resources and 4.5 Water Resources)	Area is in an arid mostly upland area, with no perennial streams. Several jurisdictional waters (intermittent streams) and small wetlands are present.	No impacts. No wetlands are present, and the three intermittent drainages will be spanned.	No impacts. No wetlands are present, and the three intermittent drainages will be spanned.	No impacts. Underground power line will avoid jurisdictional drainage and wetland.	Low impact. One jurisdictional intermittent drainage will be trenched for underground powerlines. About 100 cubic yards of fill/removal required.	No new impacts are expected.
Fish and Wildlife (See Section 3.6, Fish and Wildlife, and 4.6, Fish and Wildlife)	There is no fish habitat in the analysis area. Agricultural lands form most of the wildlife habitat. Some former agricultural lands have been enrolled in the CRP program and are mostly in grasses. Small areas of upland tree habitat exists in some of the larger draws or near structures. Shrub-steppe habitat exists in small patches on steeper slopes. Federal and state threatened and endangered species are not in the analysis area, but bald eagles and peregrine falcons may be present near the Columbia and John	No to Moderate impacts. No impacts to upland tree, shrub-steppe, grassland, or CRP habitat. No impact to Threatened or Endangered Species. Low to moderate impacts to various wildlife species, low impacts to some bird species from collision with transmission line structures.	No to Moderate impacts. No impacts to upland tree, shrub-steppe, grassland, or CRP habitat. No impact to Threatened or Endangered Species. Low to moderate impacts to various wildlife species, low impacts to some bird species from collision with transmission line structures.	No to Moderate impacts. No impacts to Threatened or Endangered Species. Moderate impacts to bird species, especially raptors and passerines and bat species. Low impacts to waterfowl, common terrestrial species.	No to Moderate impacts. No impacts to Threatened or Endangered Species. Moderate impacts to bird species, especially raptors and passerines and bat species. Low impacts to waterfowl, common terrestrial species.	No new impacts are expected.

Resource	Existing Conditions	BPA Proposed Action	BPA Middle Alternative	Klondike III Wind Farm	Biglow Canyon Wind Project	No Action Alternative
	Day rivers. Common wildlife species such as deer, elk, coyote and a variety of bird species are present. Hawks are common and nest nearby.					
Vegetation (See Sections 3.7, Vegetation, and 4.7, Vegetation)	Dryland wheat crops dominate vegetation in analysis area. Upland trees, shrub-steppe, and CRP lands are also present. No rare plant species are documented in the analysis area. Noxious weeds are common in areas not under cultivation.	Low impacts. About 17 acres of permanent impacts to agricultural lands (low impact). About 160 acres of temporary impacts to agricultural lands (low impact). Mitigation measures would be implemented to control the spread of noxious weeds.	Low impacts. About 17 acres of permanent impacts to agricultural lands (low impact). About 120 acres of temporary impacts to agricultural lands (low impact). Mitigation measures would be implemented to control the spread of noxious weeds.	Low impacts. Permanent Impacts 0.01 ac Grassland 0.0 ac Shrub Steppe 6.8 ac CRP 62 ac Agricultural (low impact) Temporary Impacts: 3.2 ac Grassland 2.0 ac Shrub Steppe 38.8 ac CRP 250 ac Agricultural (low impact) Mitigation measures would be implemented to control the spread of noxious weeds.	Low impacts. Permanent Impacts 0.88 ac Grassland 0.52 ac Shrub Steppe 10.1 ac CRP 156.7 ac Agricultural (low impact) Temporary Impacts: 1.0 ac Grassland 1.5 ac Shrub Steppe 16.5 ac CRP 363.5 ac Agricultural (low impact) Mitigation measures would be implemented to control the spread of noxious weeds.	No new impacts are expected.
Visual Resources (See Sections 3.8, Visual Resources, and 4.7, Visual Resources)	Visual character of the area is open, rolling hills, with larger hills in the background and distant views of Cascade Mountains. Important visual resources nearby include Columbia River Gorge National Scenic Area, John Day River Canyon, five Oregon National Historic Trail sites,	No to Moderate impacts. No impacts to John Day River Canyon, all five Oregon National Historic Trail sites, Lower Deschutes River Canyon and Lower Klickitat River Canyon. Low impacts to	No to Moderate impacts. No impacts to John Day River Canyon, Oregon National Historic Trail sites, Lower Deschutes River Canyon and Lower Klickitat River Canyon. Low impacts to	No to High impacts. No impacts to four Oregon National Historic Trail sites, Lower Deschutes River Canyon and Lower Klickitat River Canyon. Low impacts to Columbia River Gorge Scenic Area.	No to High impacts. No impacts to all five Oregon National Historic Trail sites, Lower Klickitat River Canyon. Low impacts to Columbia River Gorge Scenic Area and Lower Deschutes River Canyon.	No new impacts are expected.

Resource	Existing Conditions	BPA Proposed Action	BPA Middle Alternative	Klondike III Wind Farm	Biglow Canyon Wind Project	No Action Alternative
	the Lower Deschutes River Canyon, the Lower Klickitat River Canyon, and the Journey Through Time Scenic Byway.	Columbia River Gorge Scenic Area, and Journey Through Time Scenic Byway. Moderate impacts in the immediate area.	Columbia River Gorge Scenic Area, and Journey Through Time Scenic Byway. Moderate impacts in the immediate area.	Low to Moderate impacts to John Day River Canyon, Journey Through Time Scenic Byway, and one Oregon National Historic Trail site. Moderate to High impacts in the immediate area.	Low to Moderate impacts to John Day River Canyon, Journey Through Time Scenic Byway. Moderate to High impacts in the immediate area.	
Socioeconomics (See Sections 3.9, Socioeconomics, and 4.9, Socioeconomics)	Sherman County has four incorporated communities: Grass Valley, Moro, Rufus and Wasco. County population is 1,900 residents and decreasing. Vacancy rates are relatively high, between 12 and 21 percent. 750 hotel rooms are available within 30 miles. Unemployment is several percentage points higher than the State of Oregon.	Positive impact. Positive impacts due to influx of construction workers.	Positive impact. Positive impacts due to influx of construction workers.	Positive impact. Positive impacts due to influx of construction workers and long-term facility employees.	Positive impact. Positive impacts due to influx of construction workers and long-term facility employees.	No new impacts are expected.
Cultural Resources (See Section 3.10, Cultural Resources, and 4.10, Cultural Resources)	Four archeological resources were identified near the transmission line corridors, two on each alternative. Seven archeological resources were found in the Klondike III area. One archeological resource and three historic resources were found in the Biglow Canyon area.	No impacts. Towers and temporary access roads will be placed to avoid the identified resources.	No impacts. Towers and temporary access roads will be placed to avoid the identified resources.	No impacts. Towers and temporary access roads will be placed to avoid the identified resources.	No impacts. Towers and temporary access roads will be placed to avoid the identified resources.	No new impacts are expected.
Noise, Public Health, and Safety (See Sections 3.11, Noise, Public Health and	Ambient noise levels are low, about 26 dBA. Existing noise is from intermittent traffic and	Low. Noise will be below EPA thresholds for nuisance.	Low. Noise will be below EPA thresholds for nuisance.	Low. Noise may exceed state standards. Noise	Low. Noise may exceed state standards. Noise	No new impacts are expected.

Resource	Existing Conditions	BPA Proposed Action	BPA Middle Alternative	Klondike III Wind Farm	Biglow Canyon Wind Project	No Action Alternative
Safety, and 4.11 Noise, Public Health and Safety)	substation and agricultural operations. There are no public health or safety issues identified in the analysis area.	EMF below statutory thresholds No impacts to local health and safety infrastructure.	EMF below statutory thresholds No impacts to local health and safety infrastructure.	easements will be purchased for turbine locations. Circuits would all be below ground; buried cables emit no electric fields. The maximum magnetic field values for the underground circuits would be 41.1 mG. No impacts to local health and safety infrastructure.	easements will be purchased for turbine locations. Some circuits would be below ground; buried cables emit no electric fields. The maximum electric field under the overhead 34.5-kV distribution line would be less than 1 kV/m. The maximum magnetic field values for the underground circuits would be 62.9 mG. The maximum magnetic field values for the overhead circuits would be 144.6 mG. No impacts to local health and safety infrastructure.	
Air Quality (See Sections 3.12, Air Quality, and 4.12, Air Quality)	Air quality is good within the analysis area. Periodic fugitive dust emissions from agricultural operations occur, but the area has not been designated a ***non-attainment*** area.	No to Low impacts. Short-term reduction in air quality during active construction periods from fugitive dust emissions. No long-term impacts.	No to Low impacts. Short-term reduction in air quality during active construction periods from fugitive dust emissions. No long-term impacts.	No to Low impacts. Short-term reduction in air quality during active construction periods from fugitive dust emissions. No long-term impacts.	No to Low impacts. Short-term reduction in air quality during active construction periods from fugitive dust emissions. No long-term impacts.	No new impacts are expected.